

JANUARY 2008

RESEARCH ADVANCES

DISCOVERY — INNOVATION — ADVANCEMENT



Alzheimer's Disease

Depression

Diabetes

Hearing Loss

Heart Disease and Stroke

Hepatitis C

Infectious Diseases

Iraq/Afghanistan

Mental Health

Obesity

Osteoarthritis

Pain Management

Parkinson's Disease

Personalized Medicine

Posttraumatic Stress Disorder (PTSD)

Prosthetics/Amputations

Spinal Cord Injury

Substance Abuse

Tramatic Brain Injury

Vision Loss

Women's Health



Veterans Health Administration

Research & Development

Improving Veterans' Lives — www.research.va.gov



“The VA Research program is the foundation for advancements in Veterans’ health care and represents the promise of a better life.”

James B. Peake, M.D.



Veterans Health Administration
Research Development
Improving Veterans' Lives → www.research.va.gov



VA Research & Development Program: Improving Veterans' Lives through Innovation & Discovery



For over 60 years, the Veterans Affairs (VA) Research and Development program has been improving veterans' lives. The VA Research program, unique in that it is the only research program focused wholly on conducting groundbreaking research to meet the full spectrum of veterans' medical needs, is advantageously part of an integrated health care system with a state-of-the-art electronic health record. Through this dynamic combination, the VA Research program has become an acclaimed model for conducting superior bench-to-bedside research; is positioned to attract the best and brightest investigators, many of whom also work as VA clinicians; and is able to promote the quick translation of research findings into advancements in care.

Offers a promise for a brighter tomorrow—Veteran-centric at its core, the program identifies needs in the treatment setting and brings them through the research process to application in as few steps as possible, improving veterans' lives as well as the lives of their families and caregivers and many others in the nation at large who ultimately benefit from VA Research advancements in medical knowledge and health care practices. One veteran has said of the program, "Sometimes it works miracles."

Serves as a model of research excellence—Designed to take full advantage of its unique position within an integrated health care system with a state-of-the-art electronic health record, the VA Research and Development program is able to foster the development of patient-centered evidence for clinical care decision-making and serves as a model for conducting superior bench-to-bedside research.

Attracts exceptional investigators—The distinctive opportunity to conduct top quality, pioneer research in an integrated health care system and also provide patient care draws the best and brightest investigators to the program. VA investigators have won three Nobel prizes, six Lasker awards, and numerous other distinctions.

Fosters dynamic collaborations—While realizing the advantageous of an intramural research program, the VA Research program embraces its close affiliations with academic institutions, and fosters strong collaborations with federal agencies such as the Department of Defense and the National Institutes of Health and private industry sponsors. Collaborating with others that share VA's objectives in improving health care allows the program to leverage resources and accelerate the translation of research to application and strengthens the program's national health impact.

Priority Areas for Research

Meeting Deployment-Related Needs

Traumatic brain injury, post-deployment mental health (issues such as PTSD and depression), access to care, prosthetic and amputation healthcare, spinal cord injury, sensory loss, polytrauma, burn care, pain management, hearing loss, vision loss, exposure-related illnesses.

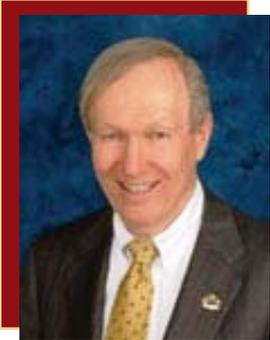
Meeting Veterans' On-Going Needs

Long-term care, Alzheimer's disease, Parkinson's disease, mental health, diabetes, obesity, heart disease, HIV/AIDS, osteoarthritis, vision and hearing loss, degenerative neurological disease (e.g., ALS, MS), cancer, substance abuse, smoking cessation, health disparities, personalized medical care (e.g., genetics), women's health.





Improving Veterans' Lives



"The future of medicine is determined by life-saving and enriching advancements brought about by research. VA Research has contributed to many of the medical treatments and diagnostic tools in use today, such as the cardiac pacemaker, CT scan, and high-performance artificial limbs. By spearheading research that directly advances the medical care of veterans, the VA Research and Development program has become an acclaimed model for conducting superior bench-to-bedside research."

Joel Kupersmith, MD
Chief Research & Development Officer
Department of Veterans Affairs



Examples of VA Research Advances

Through innovation and discovery, VA Research is advancing the healthcare and overall well-being of veterans, with benefits to the entire nation. The following examples illustrate some of the activities through which VA researchers have been accomplishing this mission:

- Using cutting-edge technology such as robotics and nanotechnology to create lighter, more functional prostheses that look, feel, and respond more like natural arms and legs.
- Developing a system that decodes brain waves and translates them into computer commands to allow quadriplegics to perform daily tasks like using email or the TV.
- Gaining new knowledge of the biological roots of posttraumatic stress disorder and developing and evaluating effective PTSD treatments.
- Establishing a Pharmacogenomics Analysis Laboratory to help advance personalized medicine for veterans.
- Learning how to deliver low-level, computer-controlled electric currents to weakened or paralyzed muscles to allow people with incomplete spinal cord injury to once again walk and perform other everyday functions.
- Identifying genes associated with Alzheimer's disease and diabetes.
- Exploring new approaches to pain treatment that will help veterans with burn injuries to persevere through rehabilitation and regain maximum function.
- Pioneering new home-dialysis techniques.
- Developing and testing the nicotine patch and other therapies to help smokers quit.
- Conducting research that has helped to increase pneumonia and influenza vaccination rates for veterans with spinal cord injury.
- Using animal models of Alzheimer's disease to identify promising new targets for early-detection tests or new drug therapies.





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- Women's Health



Alzheimer's Disease

Areas of focus for VA Research on Alzheimer's disease include finding potential drug therapies for prevention and treatment, exploring the genetic and environmental causes of the disease, and studying the best ways to provide long-term care. Additionally, VA researchers are working to discover links between Alzheimer's disease and other chronic diseases.



Examples of VA research advances

- Blood test may offer early detection**—Researchers from VA and other institutions identified a set of proteins in the blood that appear to predict the onset of Alzheimer's disease and could be the basis of a screening test. Analyzing hundreds of archived blood samples, the team compared the levels of 120 “signaling” proteins and looked for a pattern unique to Alzheimer's patients. Their quest for an Alzheimer's-specific “signature” identified 18 proteins whose concentrations varied in specific ways only in the disease samples.
- Protecting the brain with natural compounds**—VA Researchers have been involved in groundbreaking research to identify whether two naturally occurring compounds (curcumin, from the spice turmeric; and DHA an omega-3 fatty acid found mainly in fatty, cold-water fish) can protect against damage to the brain and loss of cognitive function. DHA supplements are now being tested in a nationwide clinical trial led by a geriatric neurologist at the Portland VA.
- Brain-imaging tool may offer quick diagnostics**—Researchers at the Minneapolis VA found that a brain-imaging technology called magnetoencephalography, or MEG, may be a fast, accurate, non-invasive way to diagnose mental-health and neurological disorders such as Alzheimer's disease, schizophrenia, and multiple sclerosis. The researchers recently published a study identifying specific patterns of neural activity, as captured in MEG scans, linked to six different brain disorders.

Facts About Alzheimer's Disease

One of the most common forms of dementia is Alzheimer's disease (AD), a progressive neurodegenerative condition. In this biological disease of the brain, deterioration occurs in nerve cells and parts of the brain controlling thought, memory, and language. As the disease progresses, symptoms range from mild forgetfulness to serious impairment and inability to perform everyday tasks. Alzheimer's is estimated to affect some 4.5 million Americans, and this figure is expected to triple by 2050. About five percent of men and women ages 65 to 74 have the disease, and nearly 50 percent of those age 85 and older may be affected. The annual direct and indirect costs of caring for Americans with the disease are estimated to be around \$100 billion.





Depression

As part of a comprehensive research agenda aimed at advancing the care of veterans with depression, VA researchers are developing, testing, and implementing new models of primary care; studying ways to improve outcomes among veterans with both depression and diabetes; investigating the benefits of cognitive behavioral therapy and new drug treatments; and evaluating the risk of depression among veterans recovering from stroke.

Examples of VA research advances

- Research to assist the most vulnerable —** Depression often develops in conjunction with other chronic medical problems. Therefore, some studies are strategically targeting veterans who experience depression along with conditions such as posttraumatic stress disorder, cardiovascular disease, or chronic pain. A further example is research focused on veterans with hepatitis C who develop depression as a result of their interferon treatment. VA scientists are seeking ways to ease depression in these patients so they can receive the most effective hepatitis C treatment.
- Translating Initiatives for Depression into Effective Solutions (TIDES) —** TIDES is a model of care for veterans with depression that involves collaboration between primary care providers and mental health specialists with support from a depression-care manager. The implementation of TIDES has yielded impressive results at demonstration clinics in three VA regions, with 8 of 10 depressed veterans being treated effectively in primary care without the need for referrals to additional specialists. Patients' compliance with medication and follow-up visits improved dramatically.
- Substance abuse and depression care —** Investigators with VA's Quality Enhancement Research Initiative have begun a project to expand the use of cognitive behavioral therapy to treat depression in veterans enrolled in substance-abuse treatment programs.

Facts About Depression

Major depressive disorder (MDD) is one of the most common and costly of mental disorders. Depression costs the U.S. an estimated \$66 billion per year, which includes both direct (i.e., medical care) and indirect (e.g., lost productivity) costs. Veterans with depression account for slightly more than 14 percent of total VA healthcare costs. While there are effective pharmacologic treatments and psychotherapies for MDD, studies show that depression is under-diagnosed. An untreated episode of depression may last several months, but most people with depression experience repeated episodes over their lifetime.





Diabetes

VA researchers are studying innovative strategies and technologies—including group visits, telemedicine, peer counseling, and Internet-based education and case management—to enhance access to diabetes care and improve outcomes for patients. In addition, VA researchers are seeking to develop better ways to prevent or treat diabetes, particularly in special populations such as the elderly, amputees, minorities, spinal cord injured veterans, and people with kidney or heart disease.



Examples of VA research advances

- Hunt for diabetes genes**—VA investigators have been honing in on genes that boost the risk for type 2 diabetes. One group of VA diabetes specialists, working with Mexican-American families, has narrowed their search to seven genes. The exact functions of these genes are still unknown. Two are involved in metabolic pathways not previously connected with diabetes or obesity. The remaining five appear to be “master regulators” that can alter the expression of hundreds of other genes. Ongoing research is aimed at determining exactly how these genes raise the risk of diabetes, as well as obesity.
- Aggressive therapy for type 2 diabetes**—VA is conducting a seven-year study, cosponsored by the American Diabetes Association and four pharmaceutical companies, testing the use of stronger doses of drugs currently given to lower blood-sugar levels and help the body use insulin. The aim of the study is to help prevent “macrovascular” complications such as coronary heart disease and peripheral vascular disease. Results are expected by 2009.
- Diabetes registry**—An invaluable tool for research in this area is VA’s diabetes registry, which contains data on hundreds of thousands of veterans with diabetes, including information on prescribed drugs, test results, blood pressures, and vaccinations. A recent VA study that took advantage of this resource, for example, identified factors predicting chronic uncontrolled hypertension in patients with diabetes.

Facts About Diabetes

Diabetes is a chronic disease in which the body can not produce or properly use insulin, the hormone needed by the body to change food sugar into energy. About a quarter of the veterans receiving care from VA have diabetes, and an even greater number are at risk due to overweight or obesity. Of the estimated 16 million Americans with the condition, more than 90 percent have type 2, or non-insulin-dependent, diabetes. While it has been long known that type 2 diabetes runs in families and that certain populations (e.g., Hispanics and Native Americans) are at a higher risk, it was not until recent advances in genetics that researchers began to investigate the link between specific genes and diabetes.





Hearing Loss

VA researchers, engineers, and clinicians are studying ways to prevent, diagnose, and treat hearing loss, addressing a wide range of technological, medical, rehabilitative, and social issues. One group of VA researchers is working to develop and implement a new diagnostic test for tinnitus, a potentially debilitating condition that commonly accompanies hearing loss and involves ringing, whistling, or other noises in the ears.

Examples of VA research advances

- VA partners with Army on study of blast effects**—VA researchers at the National Center for Rehabilitative Auditory Research (NCRAR) are collaborating with audiologists at Walter Reed Army Medical Center to study central auditory processing—how the brain interprets incoming sounds—in soldiers who have been exposed to blasts. Those who show symptoms of auditory processing disorders will be evaluated again within a year, either at Walter Reed or the Portland VA. In addition to auditory tests, the researchers will analyze medical records, details of the blast exposure, scores on overall tests of brain function, posttraumatic stress disorder measures, and other health data. The study will be used to determine which auditory processing disorders are more often associated with exposure to high-explosive blasts, whether there is spontaneous recovery of auditory function after blast exposure, how much recovery may be expected, and how rapidly it occurs.
- Detection of noise-induced hearing loss**—VA researchers are developing new, more sensitive methods to detect changes in the cochlea that occur before the onset of permanent noise-induced hearing loss. The methods are designed to identify problems that would not show up in standard audiometric tests. Early detection may provide the opportunity for military healthcare providers to implement precautionary procedures more effectively, preventing hearing loss among troops exposed to high levels of noise.
- NCRAR hosting training program**—The National Center for Rehabilitative Auditory Research in Portland, VA's premier center for auditory research, was one of three sites selected nationwide by the National Institute of Deafness and Communication Disorders to host a training program for doctoral students.

Facts About Hearing Loss

Hearing loss affects some 28 million Americans, including more than half of those over age 65. The most common cause of hearing loss is exposure to harmful levels of noise, either in military or civilian environments. Other possible causes are allergies, infections, drugs, genetics, or simply aging. Some hearing loss can be reversed through surgery or medication. In other cases, hearing loss is permanent but can be helped through the use of hearing aids. Noise-induced hearing loss is among the most common disabilities affecting veterans. VA pays more than \$1.2 billion annually in compensation costs for hearing loss and tinnitus—a condition that often accompanies hearing loss and involves ringing, whistling, or other noises in the ears.





Heart Disease and Stroke

Areas of focus for VA research on heart disease include evaluating and developing new treatments, probing the genetic and lifestyle causes of heart disease, and developing new rehabilitation methods, especially for stroke. Studies range from biomedical lab experiments on animal models of heart disease to large, multisite clinical trials involving thousands of patients.

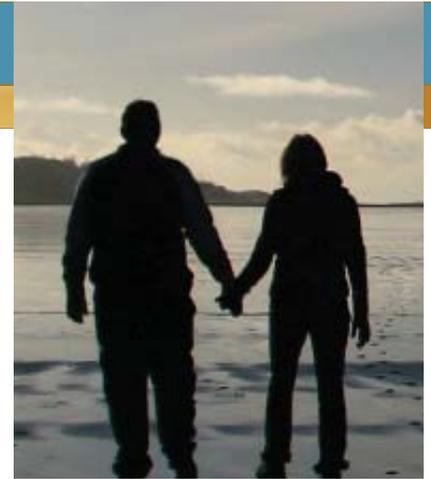
Examples of VA research advances

- Umbilical-cord stem cells and heart attack**—A VA research team found that stem cells obtained from human umbilical cord blood could significantly reduce the effects of heart attacks in rats, even when administered up to 24 hours after the onset of the attacks. If the therapy eventually proves safe and effective for humans, it could pose a way to make heart attacks less deadly.
- Robotic stroke therapy**—A trial is under way involving 158 veterans at four VA sites to test the use of a robot called the MIT-Manus to help chronic stroke patients move their affected limbs and eventually restore muscle function. The robotic therapy is designed to mimic what human therapists do when they provide “hand over hand” therapy.
- Benefits of implanted defibrillators**—VA researchers found that the use of implanted defibrillators reduced the risk of dying and improved quality of life for veterans with heart failure. Other VA investigators are studying the overall risks and cost effectiveness of this new technology.
- Depression and heart failure**—VA nurse researchers are seeking to link biochemical markers of heart failure with patterns of depression to aid in earlier screening and treatment for depression in heart-failure patients. The researchers are also exploring how patients can play a more active role in their own care for heart failure.

Facts About Heart Disease

Cardiovascular disease, which includes coronary heart disease (chest pain or acute heart attack), congestive heart failure, high blood pressure, stroke, and congenital heart defects, is America's number-one killer and the leading cause of hospitalization in the VA healthcare system. A stroke involves the sudden death of brain cells due to a lack of oxygen, caused when blood flow to the brain is impaired by the blockage or rupture of an artery. Each year, more than 15,000 veterans are hospitalized for stroke. The after-effects range from mild or moderate loss of function to severe disability. In recent years, research has demonstrated that therapy can help restore lost function to stroke survivors even many years after their stroke.





Hepatitis C

VA research on hepatitis C includes clinical trials of treatments, epidemiologic studies, investigations into the biological mechanisms of infection, and studies on improving quality of life for patients with this condition. A particular focus for VA researchers is improving the care of veterans who are infected both with the hepatitis C virus and HIV.

Examples of VA research advances

- Potential treatment for liver scarring**—A study on mice conducted by a team with the San Diego VA and the University of California showed that fibrosis in the liver—a scarring process that can result from hepatitis C and other chronic diseases affecting the liver—may be reversible. The researchers showed that if they blocked a protein linked to overproduction of scar tissue, the progression of fibrosis not only stopped, but previous damage was reversed. The new findings build on earlier work by the same team in which they first identified the protein, called C/EBP beta.
- New test for liver disease**—A team with Stanford University and the Palo Alto VA took part in a study that confirmed the reliability of a new genetic test to identify patients at high risk for developing cirrhosis of the liver. This condition, an advanced stage of fibrosis, involves severe scarring and hardening of the liver. The new test means that only higher-risk patients could be directed toward more extensive treatments, which can be costly and potentially debilitating. Weekly injections of a commonly used two-drug regimen, for example, can cost more than \$30,000 per year and lead to nausea, depression and other side effects.
- VA website on care, research**—Log on to VA's special website on hepatitis C (www.hepatitis.va.gov) to find general information about the condition as well as an overview of VA's efforts in this area. Included are descriptions of four VA research sites with special hepatitis C programs: Minneapolis, San Francisco, Seattle/Portland, and West Haven.

Facts About Hepatitis C

The liver disease hepatitis C is caused by the hepatitis C virus. It is spread through contact with infected blood or contaminated IV needles, razors, tattoo tools or other items. Hepatitis C is particularly prevalent among veterans, especially those who received blood transfusions prior to 1992. Most people with hepatitis C do not have any signs or symptoms of the disease for decades. By the time the disease is diagnosed, there can be significant damage to the liver, leading to complications such as liver cancer and sometimes resulting in death. Treatments using the protein interferon can be effective, but potential side effects such as mood disorders must be managed carefully.





Infectious Disease

One of the earliest contributions of VA researchers to medical science was the establishment of effective treatments for tuberculosis, back in the 1930s and 1940s. Since then, VA scientists have helped advance the understanding, prevention, and treatment of numerous infectious diseases, ranging from the common cold to major public-health threats such as AIDS.

Examples of VA research advances

- MRSA in the crosshairs**—A pilot study at the VA Pittsburgh Healthcare System showed that routine screening of newly admitted patients for methicillin-resistant *Staphylococcus aureus*, or MRSA, could dramatically cut the spread of the dangerous antibiotic-resistant germ, which is estimated to cause more than 94,000 serious infections and nearly 19,000 deaths each year in the United States. VA hospitals nationwide have since adopted routine screening of all new patients. Screening every patient is costly, though, so researchers at the Baltimore VA are now exploring ways to identify those patients at higher risk for the infection and determining whether targeted screening would be more cost-effective.
- Salmonella in space**—A VA research project that may lead to the development of a vaccine to prevent Salmonella poisoning was aboard the NASA space shuttle that launched March 11, 2008. Worms grown in space will be fed salmonella, which undergoes unique biological changes in microgravity. Studying the worms when they return to earth will help scientists identify a weakened strain of salmonella for use in a vaccine.
- Predicting HIV disease progression**—A team led by a VA researcher in San Antonio found that specific combinations of two genes—CCL3L1 and CCR5—could be a more accurate predictor of the progression of HIV infection to AIDS than currently used laboratory markers, such as CD4 cell counts and viral loads. The researchers also found that the combination of lab and genetic markers captures a broader spectrum of AIDS risk than either set of markers alone.

Facts About Infectious Diseases

Infectious diseases are generally classified according to the source of the infection. The major types are viral, bacterial, parasitic, and fungal. In the VA healthcare system, two viral diseases of special concern are HIV-AIDS and hepatitis C. VA maintains special websites devoted to these conditions: www.hiv.va.gov/ and www.hepatitis.va.gov. VA investigators are studying these and a wide range of other infectious diseases and working toward developing effective new preventive strategies, vaccines, and drugs. In recent years, bioterror—the use of bacteria, viruses or toxins to harm people—has become a concern for public health officials, and VA hospitals take part in a national program called BioSense to help track and investigate suspected bioterror events.





Iraq/Afghanistan

VA's Office of Research & Development has implemented a comprehensive research agenda to address the deployment-related health issues of the newest generation of veterans—those returning from operations Enduring Freedom and Iraqi Freedom (OEF/OIF). In addition to exploring new treatments for traumatic brain injury and other complex blast-related injuries, VA researchers are examining ways to improve the delivery of health care services for these veterans.



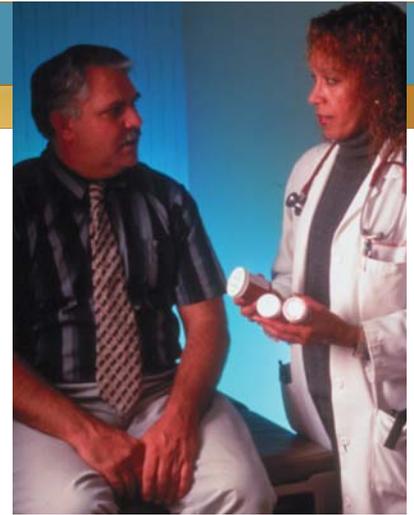
Examples of VA research advances

- **New center to study war injuries**—The recently established Center of Excellence for Research on Returning War Veterans, based at the Central Texas Veterans Healthcare System, will study brain and mental-health conditions common among troops returning from OEF/OIF. These conditions include posttraumatic stress disorder, traumatic brain injury, depression and substance abuse.
- **Protecting against brain trauma**—In lab experiments, VA investigators demonstrated that intravenous infusion of adult-derived bone-marrow stem cells may protect against brain trauma. The findings may lead to the development of early, cell-based interventions to limit the damage from traumatic injuries to the brain or spinal cord.
- **Promoting gold-standard polytrauma care**—VA Research has established a Polytrauma and Blast-Related Injury Quality Enhancement Research Initiative (PT/BRI QUERI) coordinating center to promote consistent state-of-the-art medical and rehabilitation care across VA's network of polytrauma centers, which care for veterans with complex, multiple injuries.
- **Peer visitation for polytrauma patients**—A researcher at the Puget Sound VA is collaborating with the Amputee Coalition of America (ACA) to develop a peer-visitation program to help veterans recovering from polytrauma. The ACA has successfully implemented a similar program at Walter Reed Army Medical Center.

Facts About Deployment Health

The changing nature of warfare poses new challenges to VA's healthcare system. Due to improved body armor and battlefield medicine, many troops are surviving injuries that in the past would have been fatal. These soldiers, however, are returning home with complex, multiple injuries. These "polytrauma" cases often include brain and spinal cord injuries, vision and hearing loss, nerve damage, burns, amputations, musculoskeletal injuries, infections, and emotional adjustment problems. As of April 2007, VA had treated more than 350 OEF/OIF veterans as inpatients in its polytrauma system of care, which includes four main centers and 17 network sites located at VA facilities around the country.





Mental Health

Major areas of focus for VA Research on mental health include substance abuse, posttraumatic stress disorder (PTSD), adjustment and anxiety disorders, depression, bipolar disorder, and schizophrenia. Researchers are studying and testing new drug therapies, enhancing collaborative care models in the primary care setting, and further improving access to mental health care through telehealth and other innovative technologies.

Examples of VA research advances

- **New brain-imaging techniques**—A team of VA scientists in the forefront of schizophrenia research is using “diffusion tensor imaging”—a relatively new form of MRI—to study the nerve fibers that form pathways within the brain. With this technology, researchers can now identify brain abnormalities that were previously undetectable with standard MRI scans, possibly leading to new targets for treatments for patients with schizophrenia and other conditions.
- **Effective team care for bipolar disorder**—A three-year study of 306 veterans with bipolar disorder at 11 VA medical centers found that those receiving care through a new collaborative model had better outcomes than those in usual care, without added costs. The new care model featured close teamwork between psychiatrists and nurse care coordinators, with an emphasis on teaching patients self-management skills.
- **Link between anxiety, alcoholism**—A VA research team in Chicago has discovered a genetic and biochemical pathway linking anxiety and alcoholism. Their studies focus on a molecule called CREB, which turns various genes on and off, and may point the way to new drug targets for both conditions.
- **Homeless veterans with mental illness**—Researchers with VA’s Northeast Program Evaluation Center recently documented the effectiveness of a program to help improve housing and mental-health outcomes for homeless veterans after hospitalization.

Facts About Mental Health

Mental health conditions such as schizophrenia, depression, and anxiety are common in the United States, with more than a quarter of Americans suffering from a diagnosable mental disorder in any given year. Mental health is a major focus for VA’s healthcare system. A recent health survey of 1.5 million veterans enrolled in VA health care found that more than a third had at least one mental health diagnosis. Depression was the most common diagnosis, followed by anxiety disorders—including PTSD—and schizophrenia. Schizophrenia alone affects some 100,000 VA patients and accounts for nearly 12 percent of VA’s total healthcare costs.





Obesity

VA research on obesity focuses on areas such as examining the biological mechanisms involved in weight gain and weight loss; comparing the safety and effectiveness of various obesity treatments; and identifying the best strategies to promote exercise and healthy eating among veterans, thus preventing overweight and obesity in the first place. These efforts complement VA's "MOVE!" program, a national weight-management and exercise program designed by the VA National Center for Health Promotion and Disease Prevention.

Examples of VA research advances

- Pedometers result in modest weight loss**—Researchers with VA and the University of Michigan reviewed data from nine studies and determined that on average, people who used a pedometer to track and motivate their walking were able to lose about a pound every 10 weeks, or about five pounds per year. The weight loss resulted from an average step-count increase of between 2,000 and 4,000 steps—one to two miles—per day. While such weight loss may be less than dramatic, pedometer-based walking programs are generally endorsed by experts for the range of possible health benefits they confer, such as increased aerobic fitness and lower blood pressure.
- Surgery effective for severe obesity**—Researchers with VA and RAND Health analyzed 225 existing studies and concluded that bariatric surgery is more effective than drugs to help severely obese patients lose weight, and that most drugs prescribed for overweight and obesity do promote modest weight loss, at least in the short term, but only when combined with exercise and changes in diet. The researchers said bariatric surgery appears to improve or even eliminate diabetes, high blood pressure, sleep apnea, and high cholesterol, but the complication rate can be as high as 20 percent.
- Low-carb lifestyles**—A team at the Durham VA Medical Center and Duke University has published several studies documenting that eating a diet lower in carbohydrates tends to lead to weight reduction, lower triglycerides, and other benefits.

Facts About Obesity

Obesity has skyrocketed in the past four decades and reached epidemic proportions. Two in three Americans are overweight, and nearly one in three is obese. The problem may be even more severe among those who turn to VA for their healthcare, with one study finding that 68 percent of these veterans were overweight and 37 percent obese. This trend carries major implications for American healthcare, since obesity increases the risk of heart disease, high blood pressure, diabetes, arthritis, and other diseases.





Osteoarthritis

VA researchers are working to understand the biological causes of cartilage degeneration and testing new drugs and other medical and rehabilitative treatments for arthritis. Among the VA sites conducting important work in this area is the Center of Excellence on Bone and Joint Rehabilitation, based at the Palo Alto VA.

Examples of VA research advances

- Popular remedies put to the test**—A nationwide clinical trial led by a VA investigator and involving nearly 1,600 patients with osteoarthritis of the knee found little benefit overall for the widely used nutritional supplements glucosamine and chondroitin sulfate. The findings did suggest, however, that the supplements may help those with more severe pain. The study, led by Dr. Daniel Clegg of the Salt Lake City VA and the University of Utah and funded by the National Institutes of Health, was the most rigorous trial to date of the supplements, which are taken either alone or in combination by millions of arthritis sufferers around the world.
- Racial disparities in joint replacement**—Researchers at VA's Center for Health Equity Research and Promotion are studying how to better educate African American patients about knee replacements. African Americans are up to five times less likely than whites to undergo the procedure. In a new study involving up to 600 older African American veterans in Pittsburgh and Cleveland, the researchers are testing whether an educational video plus counseling helps close the racial gap in the use of the procedure.
- Improving self-care**—Researchers at the Durham VA and Duke University have launched the Self-Management of Osteoarthritis in Veterans Study to test whether providing special educational materials and following up with monthly telephone support can help patients with arthritis reduce their pain levels. The study will include 519 veterans with osteoarthritis of the hip or knee.

Facts About Osteoarthritis

Osteoarthritis, or degenerative joint disease, is the most common form of arthritis. It affects up to 20 million Americans, most of them elderly. Symptoms include pain, stiffness, and swelling in the joints. Scientists once thought the disease resulted simply from “wear and tear” on the joints; now they are exploring a complex web of biological factors that may contribute to cartilage breakdown. Increased attention in recent years to the possible side effects of certain pain-relieving medications has underscored the urgency of research on the prevention of arthritis and alternative treatments for pain symptoms.





Pain Management

VA is working to develop powerful new approaches to alleviate veterans' pain, which may result from spinal cord injury, burns, amputations, traumatic brain injury, or other conditions that are not combat related. VA's research program focuses on assessing, managing, and treating chronic pain; helping veterans seamlessly transition to civilian life; developing novel therapies for nerve-related pain; and developing new pain coping strategies.



Examples of VA research advances

- **Cellular clues**—VA scientists are examining changes at the cellular and molecular levels for clues about what causes pain and how to treat it. For example:
 - Using a rat model they developed to resemble a debilitating pain condition called complex regional pain syndrome (CRPS), investigators are working to characterize cellular changes in support of promising new treatments for pain and inflammation.
 - Investigators have identified a cellular pathway that conveys pain signals to the brain and hope to expand upon the discovery to develop a new pain treatment.
 - VA researchers have identified a molecular basis for “phantom pain,” in which patients have the sensation of pain in a limb that has lost all feeling due to spinal cord injury, or in the case of amputees, sense pain in a limb that is no longer there.
- **Vaccine's pain effect**—Tested by VA and the National Institutes of Health (NIH), a vaccine for shingles not only substantially reduces incidence of shingles, but also greatly cuts the risk of severe chronic nerve pain known as post-herpetic neuralgia.
- **More promising projects**—With the Department of Defense, VA is funding a study of the benefits of intervening early with regional anesthesia for pain control after certain kinds of combat-related traumatic injuries. Other projects VA is initiating are gene therapy for spinal cord pain and approaches to chronic back pain including education, exercise, chiropractic care, and telehealth outreach.

Facts About Pain Management

Pain is one of the most common reasons people consult a physician and is cited as the most common symptom in soldiers returning from combat. Research suggests that a quarter of returning Operation Enduring Freedom/Operation Iraqi Freedom veterans report chronic pain that interferes with their daily activities—among the most common types, back pain from the weight of body armor and equipment and pain from traumatic nerve injury. Believing that no patient should suffer preventable pain, doctors and nurses throughout the VA are required to treat pain as “a fifth vital sign,” to be assessed and recorded along with blood pressure, pulse, temperature, and breathing rate.





Parkinson's Disease

VA Research has six Centers of Excellence focused on Parkinson's disease, based in Houston, Philadelphia, Portland, Richmond, San Francisco, and Los Angeles. Researchers at these sites are studying the biochemical pathways involving dopamine—a brain chemical implicated in Parkinson's disease—and testing a variety of treatment approaches, including medication, surgery, and electrical stimulation.

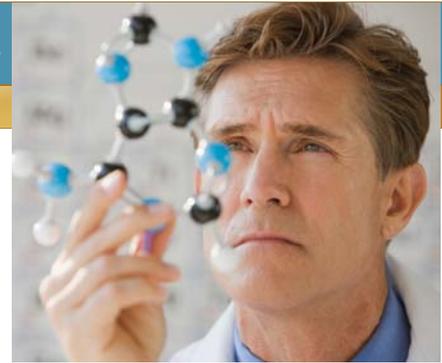
Examples of VA research advances

- **Deep-brain stimulation being tested**—VA is co-leading a clinical trial comparing drug therapy with deep-brain stimulation. In deep-brain stimulation, thin wires are implanted in the brain and electrical pulses are delivered from a pacemaker-like device to the areas of the brain where tremors originate. The procedure appears to dramatically improve movement symptoms for some patients.
- **Sleep trouble in Parkinson's tied to specific brain cells**—The sleep abnormalities seen in many people with Parkinson's disease—sleep attacks during the day and poor sleep at night—may be due to a lack of brain cells that make a chemical called hypocretin, according to research by a team with VA and the University of California, Los Angeles. In the study, the researchers examined 16 brains from cadavers—5 from normal adults and 11 in various stages of Parkinson's. They found an increasing loss of hypocretin cells with disease progression—up to a 62-percent loss in stage 5 Parkinson's.
- **Adult stem cells may replace depleted brain cells**—VA researchers in Richmond are exploring the use of adult stem cells that, when transplanted into the brain, may transform into dopamine-producing neurons to help combat Parkinson's.
- **Possible link to toxins**—At least two groups of VA researchers are studying whether exposure to neurotoxins may trigger Parkinson's disease.

Facts About Parkinson's Disease

Parkinson's disease is a disorder of the central nervous system resulting in rigidity of the muscles, delayed movement, poor balance, and tremors. It affects as many as 1.5 million Americans, mostly people over age 50. Some 50,000 new cases are diagnosed annually. VA treats at least 40,000 veterans with this debilitating disorder each year. Parkinson's patients have a progressive loss of the brain chemical dopamine, caused by the death of dopamine-producing nerve cells. Experts suspect that a combination of genetic and environmental factors are responsible for this loss.





Personalized Medicine

VA's Office of Research & Development is at the forefront of developing safer, more effective treatments based on new knowledge about the role of genes in health and disease. The goal is to provide medical care that is personalized specifically to the genetic makeup of individual veterans. This approach is referred to as personalized medicine. Genomic analysis has already provided tremendous insights into the origins of diseases that affect large numbers of veterans, such as diabetes and cancer. Genomic analysis may also help predict veterans' response to certain drug treatments.

Examples of VA research advances

- Pharmacogenomics Lab**—VA has established its first Pharmacogenomics Analysis Laboratory, at the Little Rock VA. The lab will run genetic tests for individual veterans to help predict their response to certain drugs. The lab will also work with VA's Cooperative Studies Program, which coordinates clinical trials involving up to thousands of patients at multiple sites. The lab will scan DNA from study participants—with their consent—to determine if certain genetic variations are linked to particular medical conditions.
- Assessing veterans' attitudes**—To learn about veterans' attitudes toward genomic medicine and explore issues of concern, VA is working with the National Human Genome Research Institute and the Genetics and Public Policy Center at Johns Hopkins University. The joint effort includes surveys and focus groups with veterans recruited through various sources nationwide, including Veterans Service Organizations, VA medical centers, outpatient clinics, and readjustment counseling centers.
- Genetics of alcoholism**—VA researchers have been working with colleagues to probe which genes may be linked to alcoholism risk and treatment response. Some of these efforts are conducted through the Collaborative Studies on Genetics of Alcoholism initiative of the National Institute on Alcohol Abuse and Alcoholism.

Facts About Personalized Medicine

With the recent completion of the Human Genome Project and other gene-mapping efforts, scientists now have a detailed map of humans' genetic structure. Research is now focused on how to apply this knowledge to medical care, with the goal of customizing patients' care based on their individual genetic make-up. This might involve, for example, predicting a patient's risk for a certain condition, or his response to a particular drug. Scientists have been laying the groundwork for this field by scanning huge batches of DNA—often obtained through research studies—and analyzing which genetic variations are statistically associated with particular diseases or other health characteristics.





Posttraumatic Stress Disorder

VA's Office of Research and Development supports numerous studies aimed at understanding, treating, and preventing posttraumatic stress disorder (PTSD). These studies range from investigations of the genetic or biochemical underpinnings of the disease to evaluations of new or existing treatments, including large multisite clinical trials. A VA study published in 2007 found that of 103,788 veterans of operations Enduring Freedom and Iraqi Freedom veterans seen at VA facilities between 2001 and 2005, some 13 percent had received a diagnosis of PTSD.

Examples of VA research advances

- Drug may help PTSD nightmares—**In pilot studies, VA researchers based at the Puget Sound VA found that prazosin, an inexpensive generic drug already used by millions of Americans for high blood pressure and prostate problems, may improve sleep and reduce trauma nightmares for veterans with PTSD. No drug has previously been found to effectively improve these PTSD symptoms. A large, multisite trial to confirm the effectiveness of prazosin for this purpose is now under way.
- Prolonged-exposure therapy shown effective—**VA researchers showed that prolonged-exposure therapy—in which therapists help patients recall their trauma memories under safe, controlled conditions—was effective in reducing PTSD symptoms in women veterans who developed PTSD after experiencing sexual trauma in the military. Women in the trial who received prolonged-exposure therapy had greater reductions of PTSD symptoms than those who received only emotional support and counseling focused on current problems.
- Clinical trial for veterans with chronic PTSD—**VA has launched the first ever multi-center clinical trial of a drug to treat military-related chronic PTSD. The study will involve 400 veterans at 20 VA medical centers nationwide and will evaluate whether risperidone, one of the safest and most extensively studied antipsychotic medications, is effective in veterans with chronic PTSD who continue to have symptoms despite receiving antidepressant medications.

Facts About PTSD

PTSD is a psychiatric disorder that can affect people who have experienced life-threatening events, such as combat, a terrorist attack, or a personal assault. Symptoms include flashbacks, nightmares, depression, and social withdrawal, as well as physical health changes. Treatment often includes anti-anxiety drugs or other medication, as well as exposure therapy, a form of cognitive-behavioral therapy in which patients recall their traumas in a safe setting and gradually learn to adjust their emotional response.





Prosthetics/Amputations

VA researchers are exploring the use of leading-edge technology such as robotics, tissue engineering, and nanotechnology to design and build lighter, more functional prostheses that look, feel, and respond more like real arms and legs. They are also exploring new methods to improve and maximize the reconstruction of injured extremities. Additionally, researchers are studying how best to match available prosthetic components to the needs of amputees, especially those who seek to maintain an active, demanding lifestyle and require versatile, high-performance prostheses.

Examples of VA research advances

- New bionic ankle**—The first powered ankle-foot prosthesis, an important advance for lower-limb amputees, was unveiled this past summer at the Providence VA Medical Center. The device was developed by Dr. Hugh Herr of MIT and the Center for Restorative and Regenerative Medicine, a collaboration among VA, MIT, and Brown University. The ankle-foot propels users forward using tendon-like springs and an electric motor. It was demonstrated at the Providence VA event by Dr. Herr, himself a double amputee, and by an Army veteran who lost a leg after a bomb blast in Iraq.
- Clinical trials under way for high-tech arm**—Biomedical engineer Dr. Richard Weir at the Chicago VA and Northwestern University and colleagues at other institutions are working to create the world's most advanced prosthetic hand-and-arm system, with funding from the Revolutionizing Prosthetics Program of the Defense Advanced Research Projects Agency (DARPA). Initial prototypes are currently being tested in clinical trials. The goal is a limb that is almost identical to a natural one, including brain control.
- Limb loss prevention**—Researchers at VA's Center of Excellence for Limb Loss Prevention and Prosthetic Engineering in Seattle recently studied 400 CT scans of diabetic feet to identify which foot types are at highest risk for the ulcers that often lead to amputation.

Facts About Prosthetics

As of June 30, 2007, the Department of Defense had reported 1,005 service members who suffered limb loss in operations Enduring Freedom and Iraqi Freedom (OEF/OIF). Many are now in care in the VA system. Foot ulcers from diabetes, which affects more than a quarter of VA patients, are another major cause of amputations. In the U.S., people with diabetes account for about two-thirds of all lower-limb amputations. VA has long been a world leader in prosthetics research and care, and is now in the forefront of developing and testing innovative prosthetic devices for OEF/OIF veterans returning home with limb loss.





Spinal Cord Injury

VA researchers are studying the biological processes involved in spinal cord injury (SCI), in hopes of finding a cure. They are also working to develop better treatments and adaptive technologies for veterans and other with SCI. Another focus of research is preventing the medical complications that often develop as a result of this disability. For example, VA investigators are developing microstimulators that help to prevent respiratory problems by recreating natural breath and cough patterns. Respiratory problems are the leading cause of death in patients with SCI.

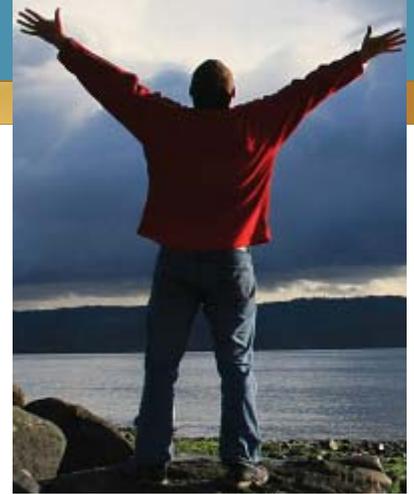
Examples of VA research advances

- Brain-computer interfaces**—A team at VA's Center for Restorative and Regenerative Medicine—a collaboration among VA, Brown University, and MIT—is advancing a system called BrainGate, which has already shown promise in enabling patients with paralysis to use only their thoughts to control external devices. The system uses a tiny sensor implanted in the brain. The sensor sends brain signals to an external decoder that translates them into commands for electronic or robotic devices.
- Easing chronic pain**—Chronic pain is experienced by more than 50 percent of patients with SCI. Researchers at the West Haven VA and Yale University have identified a particular form of sodium channel—a specialized protein in the membranes of brain cells that regulates the flow of sodium into the cells—that is responsible for conveying pain signals to the brain. The scientists are working to develop a new therapy based on this knowledge. Other research teams are exploring the possibility of grafting specially cultured neurons, or nerve cells, into the spinal cord. The cells would release natural body chemicals, such as GABA, that have a pain-relieving effect.
- Functional Electrical Stimulation (FES)**—VA researchers and colleagues in Cleveland are developing FES-based walking systems, hand-grasp systems, and other devices that expand the abilities of patients with spinal cord injury and increase their opportunities for employment and independence. Researchers here are now collaborating with the “BrainGate” group (*see above*) to develop applications that may benefit those with spinal cord injury as well as amputees.

Facts About SCI

Spinal cord injury (SCI) impairs the brain's ability to send messages to the rest of the body, and can result in paralysis, loss of feeling, chronic pain, and many other serious medical problems. SCI is estimated to affect some 250,000 Americans, with 10,000 new injuries occurring each year, mostly among young males. VA has the largest single network of SCI care in the nation; in 2006, VA provided a full range of care to nearly 26,000 veterans with SCI, and specialty care to about 13,000 of these veterans.





Substance Abuse

For decades a leader in the field of addiction research, VA Research continues to support a broad portfolio examining substance-abuse prevention, screening, and treatment, including studies aimed at understanding the genetic factors that may predispose people to alcohol or drug abuse and addiction. One area of particular focus is improving substance-abuse treatment for homeless veterans.

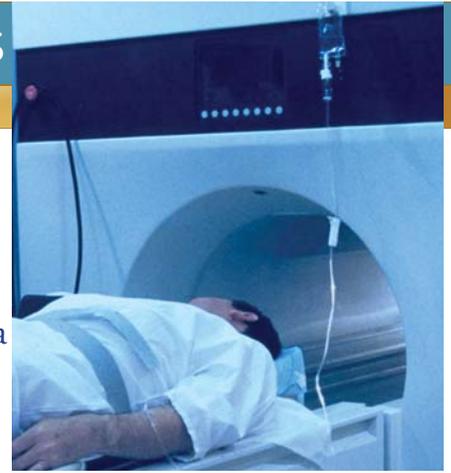
Examples of VA research advances

- Predicting relapse after alcohol abuse treatment**—VA researchers compared remission and long-term relapse rates among people with alcohol-use disorders who entered treatment or Alcoholics Anonymous (AA) within their first year of seeking help, and those who did not initially obtain treatment or join AA. They found that those who entered treatment or AA early on were far more likely to be remitted after 3 years and to stay remitted even after 16 years. The researchers said the findings support the notion that “natural remission”—getting sober without formal treatment or help—may be less stable than remission that comes about through participation in AA or treatment.
- Study tracks cognitive impairment**—In a study at the Jackson, Mississippi, VA Medical Center, veterans entering treatment for alcohol or substance abuse were administered cognitive and memory tests. Significant impairments were found in about a third of the nearly 300 veterans in the study. The researchers hope to draw attention to the implications of their findings for clinicians and counselors interested in identifying barriers to treatment compliance and retention.
- VA screening program a success**—In 2004, VA implemented a nationwide annual screening for alcohol misuse. A recent study showed that VA successfully implemented the new screening program in more than 800 outpatient clinic sites nationwide. Based on medical record reviews, 93 percent of VA outpatients were screened for alcohol misuse, with a quarter of these veterans testing positive during a one-year period.

Facts About Substance Abuse

In fiscal year 2006, more than 354,000 veterans received care in VA for substance-use disorders (SUD)—i.e., alcohol or drug abuse or addiction. More than half of these patients also had a psychiatric disorder. In addition to those treated for SUD, nearly 45,000 veterans received care for nicotine dependence. The overwhelming majority of SUD patients in VA—some 96 percent—are men. The most common drugs being used by veterans treated for SUD is cocaine. Overall, the number of veterans being treated for SUD has risen some 22 percent over the past four years.





Traumatic Brain Injury

VA researchers are conducting cutting-edge research to help veterans with traumatic brain injury (TBI)—a diagnosis covering a wide range of injuries to the brain—to regain maximum function. VA research in TBI focuses on gaining a better understanding of the brain changes in TBI; refining diagnostic tools; developing drugs to prevent or treat brain injury; designing improved methods for assessing treatment effectiveness; and helping veterans with TBI to reintegrate into their community.

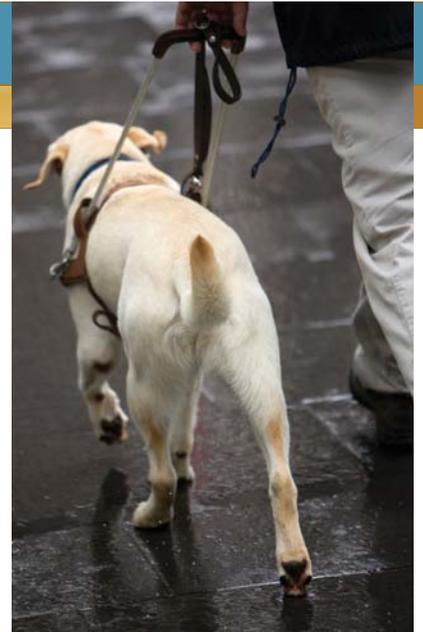
Examples of VA research advances

- Brain changes**—VA researchers are conducting sophisticated imaging studies to better characterize brain changes in TBI and are studying cellular repair after brain injury to lead to practical treatments and enhancements to quality of life. Using animal models of brain injury, VA scientists have shown that injecting bone marrow stem cells from adults can protect against brain trauma.
- Personalized medicine**—Because genetic factors may determine which veterans develop TBI after being injured and how they respond to treatment, a new VA registry will analyze DNA samples for veterans of Operation Enduring Freedom and Operation Iraqi Freedom toward tailoring medical approaches for these patients.
- Screening approaches**—VA scientists are refining methods of screening to reliably diagnose TBI and predict patients' outcomes and care needs.
- Community reintegration**—VA investigators are examining ways to help veterans with TBI achieve a smooth transition back into daily life, including family, school, and work roles. Investigators are also looking at ways of restoring independence to veterans with TBI—for example, by using a simulator to re-train them to drive.
- Research impact**—VA's Quality Enhancement Research Initiative (QUERI) focuses on rapidly translating new discoveries in TBI into patient care, as well as providing care for affected families. In another effort to maximize the yields from TBI research, a VA state-of-the-art conference in May 2008 has as its focus the identification and conduct of research to improve health care for veterans with this form of injury.

Facts About Traumatic Brain Injury

Traumatic brain injury is a complex type of injury that can result in physical symptoms as well as intellectual and emotional problems. TBI is a substantial cause of civilian and military death and disability among Americans, with annual economic costs of TBI in the civilian sector alone being conservatively estimated at over \$50 million. TBI, in forms ranging from mild to severe, is estimated to affect at least 20 percent of U.S. troops wounded in Iraq or Afghanistan and has been called the signature injury of modern combat.





Vision Loss

One of the most exciting areas of VA research in this field is the development of an artificial retina to restore vision to those affected by macular degeneration or retinitis pigmentosa. VA researchers are also working to improve or design new assistive devices for the visually impaired, and to develop more accurate and efficient methods of vision assessment.

Examples of VA research advances

- Manmade protein could help eye problems—**Potentially blinding blood-vessel growth in the cornea, resulting from eye injury or even surgery, can be reduced by more than 50 percent with a new synthetically engineered protein, according to a recent animal study at the August (Ga.) VA and the Medical College of Georgia. The researchers believe the protein may prove of use therapeutically in any condition where blood-vessel formation is detrimental, such as cancer, diabetic retinopathy and macular degeneration.
- Traffic safety for low-vision pedestrians—**VA researchers in Atlanta are helping to test different models of pedestrian traffic signs—namely, Walk and Don't Walk—to determine which are the most visible for those with impaired vision.
- GPS and rehabilitation—**Researchers are exploring the use of the Global Positioning System and similar technologies to help measure the effectiveness of blind-rehabilitation programs. The goal is to track participants' mobility, with their consent.
- Help for macular degeneration—**In a Chicago-based VA study, veterans with age-related macular degeneration who took the antioxidant lutein by itself or in combination with other nutrients showed major improvements in several symptoms. The study was the first to show that lutein could not only slow the progression of the disease but actually help reverse it. Lutein is a yellow pigment found in certain fruits and vegetables and in egg yolks and corn.

Facts About Vision Loss

There are some 10 million people who are blind or visually impaired in the United States. At least half are age 65 or older. Age-related macular degeneration (ARMD) is the leading cause of vision loss among veterans and older adults. For those under 60, it is diabetic retinopathy. Macular degeneration involves impairments to the macula, a tiny area at the back of the eye that contains millions of light-sensing cells. In wet ARMD, which accounts for 90 percent of the blindness caused by the disease, blood and other fluids leak under the macula. Other common causes of vision loss among veterans include cataracts, glaucoma, and stroke.





Women's Health

In response to the increasing number of women veterans, VA Research has focused additional attention on the unique health needs of this population. Current studies are examining the general health issues and healthcare usage of women veterans; exploring the experiences of women veterans regarding sexual and military-related traumas; and assessing the delivery of VA care for female veterans and identifying opportunities for improvement.

Examples of VA research advances

- Study examines women's perceptions of VA**—Many women veterans who are not enrolled in the VA health system are unaware that VA provides women's healthcare, according to a recent study by VA researchers in Los Angeles. The study also found that overall quality of care, access to gender-appropriate services, and a gender-sensitive environment that respects and allows for privacy were among the healthcare issues that matter most to women veterans.
- Violence against servicewomen**—A VA research team is interviewing about 500 active-duty women and female veterans from five Midwestern states, all currently or formerly with the reserves or National Guard, with the goal of identifying risk factors for sexual assault and physical violence against women in the military. The study will also look at health outcomes for the study participants and any barriers to VA care.
- New mammogram guidelines**—Dr. Douglas Owens, a health-services researcher at the Palo Alto VA and Stanford University, chaired an American College of Physicians committee that recently published a new set of mammogram guidelines for women in their 40s. The guidelines, based on a rigorous review of the medical literature, call for periodically performing individual assessments of breast-cancer risk; informing women of the potential benefits and harms of the procedure; and incorporating women's preferences and risk profiles into the screening decision.

Facts About Women's Health

As of Oct. 2007, there were about 1.74 million women veterans in the United States and Puerto Rico, accounting for some seven percent of the U.S. veteran population. Women currently make up 15 percent of the active-duty force and 23 percent of the reserve force; it is projected that by 2010 woman will account for 10 percent of the veteran population. In addition to offering comprehensive women's healthcare, VA supports medical and psychosocial research aimed at improving the lives of women veterans.





***For more information about VA research,
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Veterans Health
Administration
R&D
www.research.va.gov

R&D Communications (12)
103 South Gay Street, Ste 517
Baltimore, MD 21202
(410) 962-1800 x223
Research.publications@va.gov